



Peconic River Remedial Alternatives Workshop

Brookhaven National Laboratory

Presented by:

CH2MHILL


December 12, 2000

Presentation Outline

- Overview of CH2M HILL
- Presenters
 - Jim Bays
 - Jim Jordahl
 - Bob Tossel
- Relevant Experience
- Summary
- Q&A

CH2M HILL

- Who We Are – 10,000 employees in 150 offices worldwide
- Employee owned – every employee has a stake in a project's success
- Mission – Global project delivery company making technology work to help our client build a better world



Successful Remediation on the Peconic River will Require:

- Reaching consensus with agency and community stakeholders on the remediation plan ***through multiple purpose planning***
- Integrated planning and project delivery ***through functional system establishment***
- ***Adaptive approach to*** stream and wetland restoration
- ***Detailed*** operation and monitoring plan



World Class Project Delivery Resources

Combining People and Systems for Success

- Proven successful in over \$10B of projects worldwide
- Experience on over 500 RCRA and 450 CERCLA sites
- Deliver over \$2B in major environmental construction projects per year
- Operating over 700 treatment systems
- Bring engineering, scientific and construction resources together under one system



Sugarland Run - Environmental Restoration

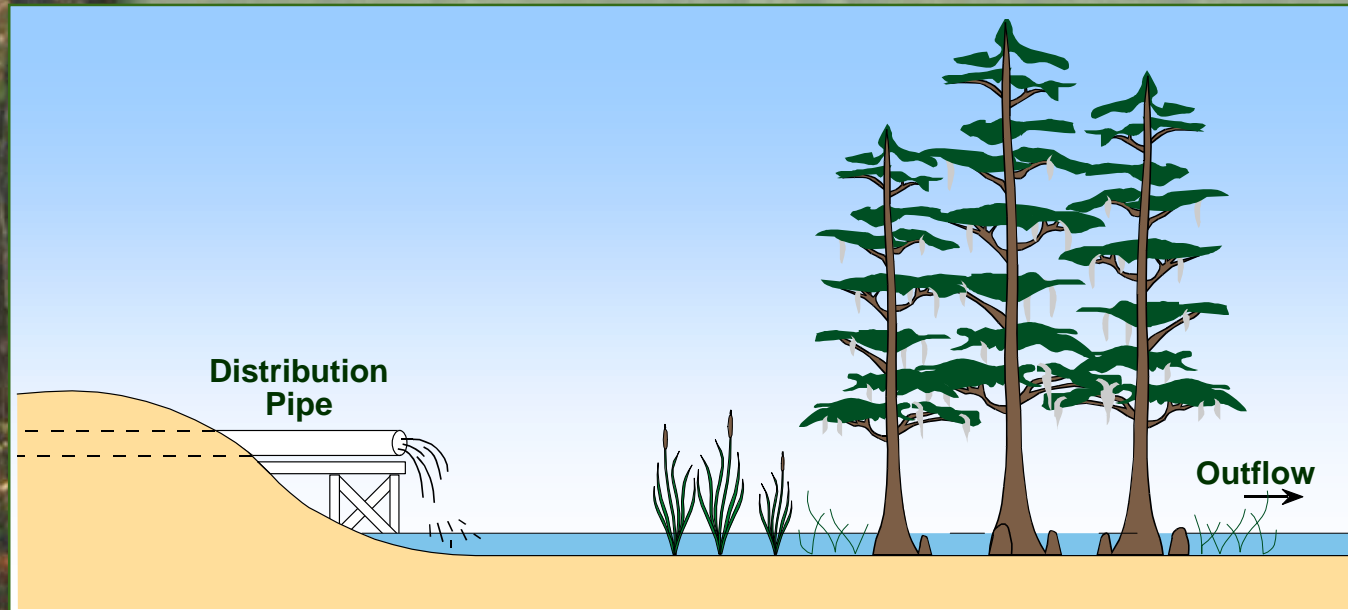
- Restoration Plan saved client >\$30 million
- Delivered design/build services
- Wetland Stream Restoration/Enhancement
- Stormwater BMPs
- Remove non-native invasive species - replace with native

Hopkins Farm Sediment Remediation

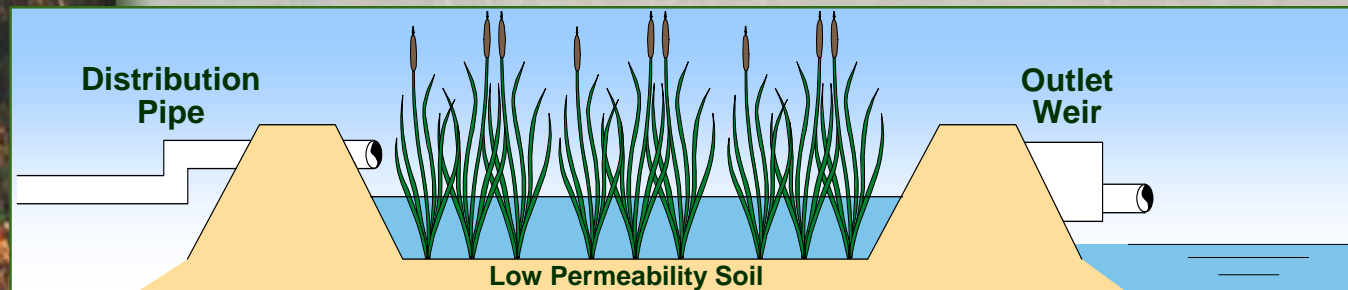
- Stream realignment
- Agency Coordination--Swamp Pink
- Hydrological modeling and monitoring
- Stream and wetlands restoration



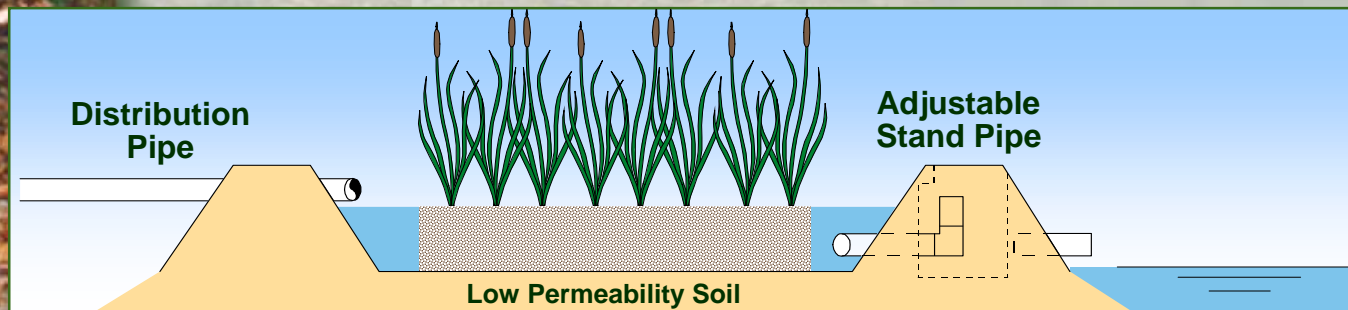
Types of Treatment Wetlands



**Natural
Wetlands**



**Surface
Flow (SF)
Constructed
Wetland**



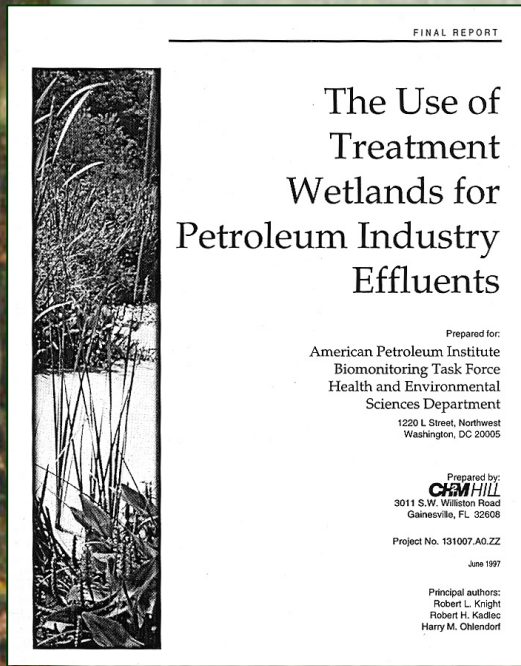
**Subsurface
Flow (SSF)
Constructed
Wetland**

General Treatment Wetland Performance

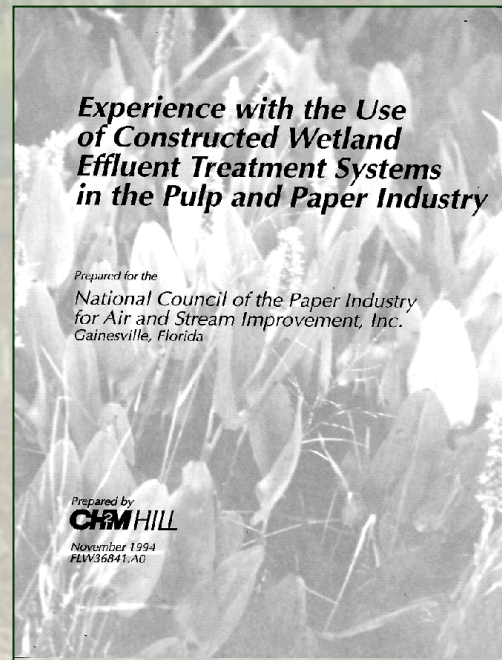
<u>Parameter</u>	<u>Removal Efficiency</u>	<u>Limit</u>
BOD	50 – 90%	2 – 10 mg/L
TSS	50 – 90%	2 – 10 mg/L
TN	40 – 90%	1 – 3 mg/L
TP	10 – 90%	<1 mg/L
Fecal Coliforms	80 – 99%	<100 – 1,000 col/100 mL
Metals	50 – 90%	Below Detection

^aRemoval efficiencies and effluent concentrations are very dependent upon influent concentration and hydraulic loading rate.

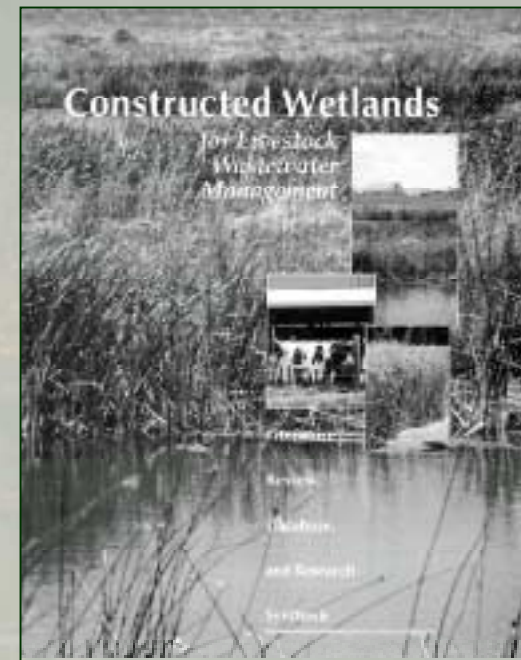
But Studies Show Wetlands Treat Difficult Contaminants



API 1997



NCASI 1994



EPA 1997

Douglas Road Landfill Leachate Treatment System



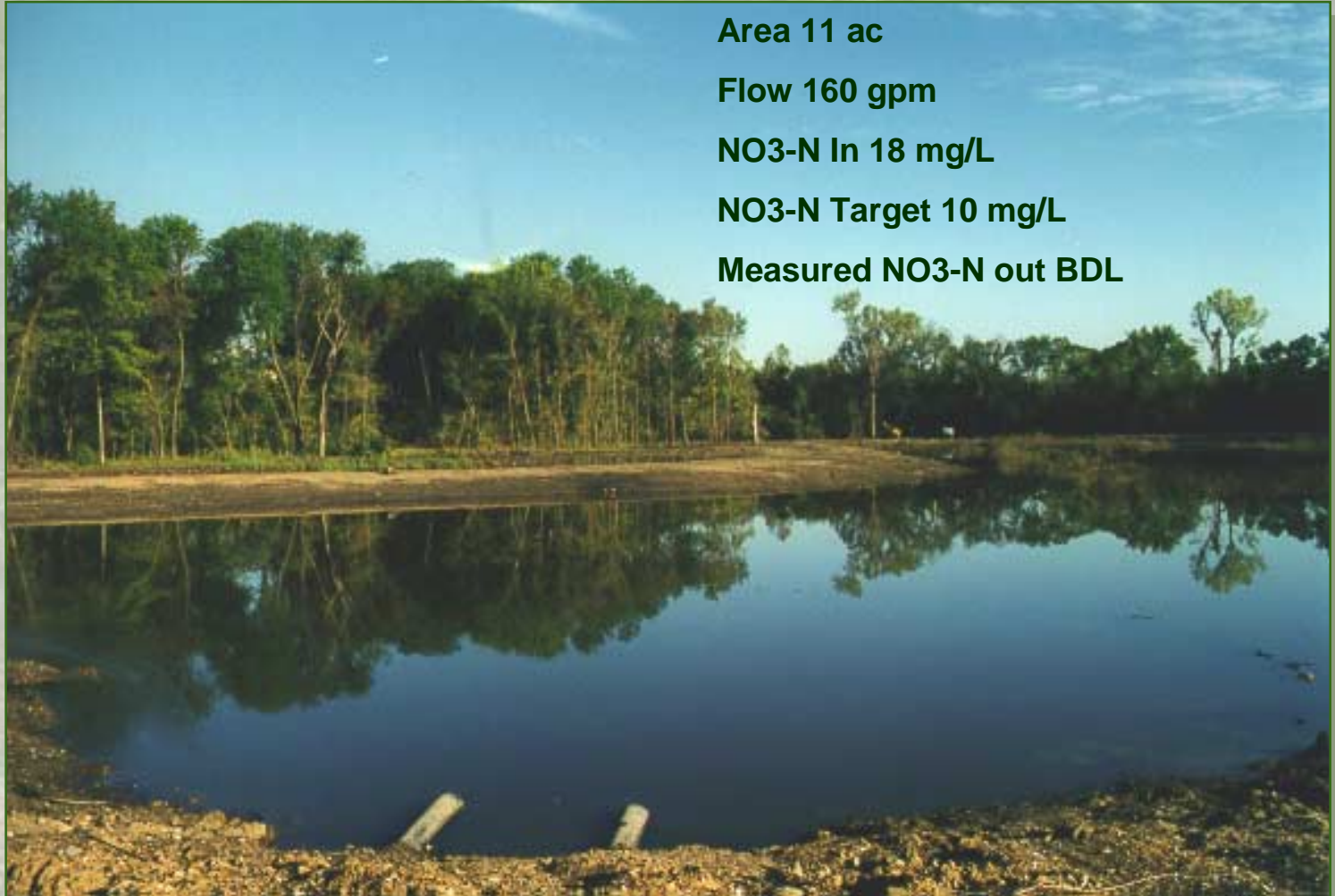
Douglas Road Landfill

Recent Performance Data

Data	TCE		Arsenic		Flow (gpm)
	Influent (ug/L)	Effluent (ug/L)	Influent (ug/L)	Effluent (ug/L)	
10/4/2000	6.3	<1	1.1	<1	281
10/29/2000	4.7	<1	1.1	<1	535
11/2/2000	6.2	<1	1.4	<1	281

Jayhawk Treatment Wetland D/B

Galena KS



Area 11 ac

Flow 160 gpm

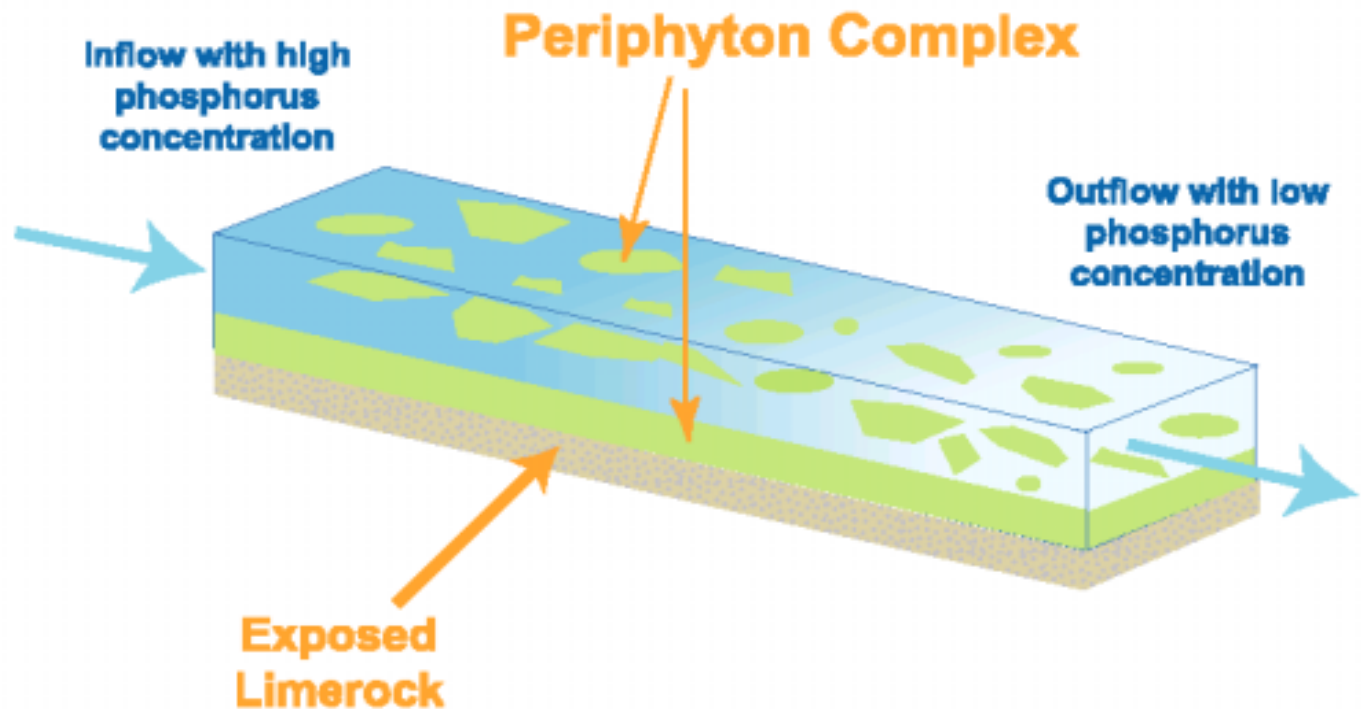
NO3-N In 18 mg/L

NO3-N Target 10 mg/L

Measured NO3-N out BDL

Periphyton-based STA Overview

Periphyton-based Stormwater Treatment Area (PSTA)



Everglades Nutrient Removal (ENR) Project



Source: SFWMD Website

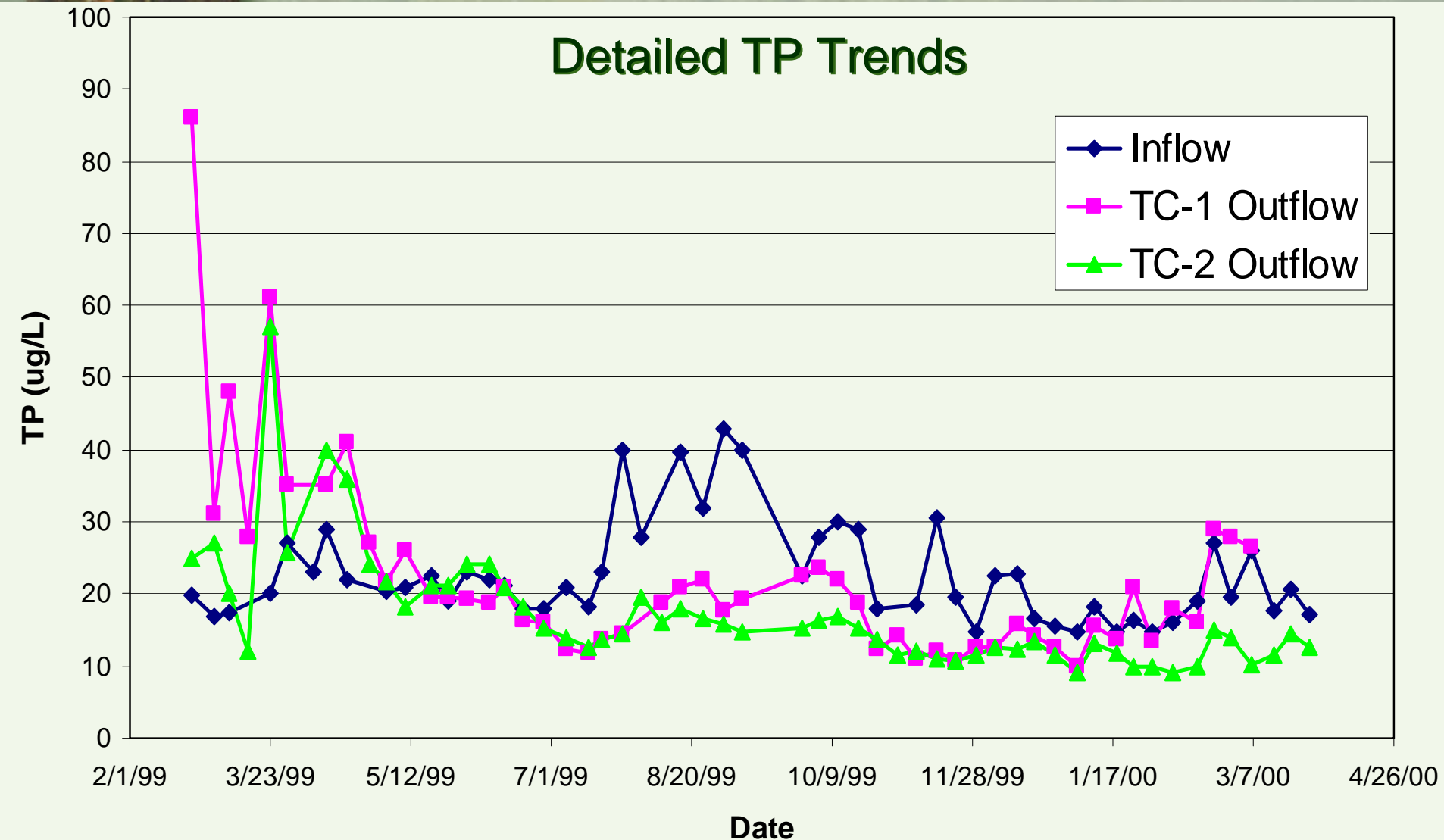
Periphyton with Sparse Macrophytes



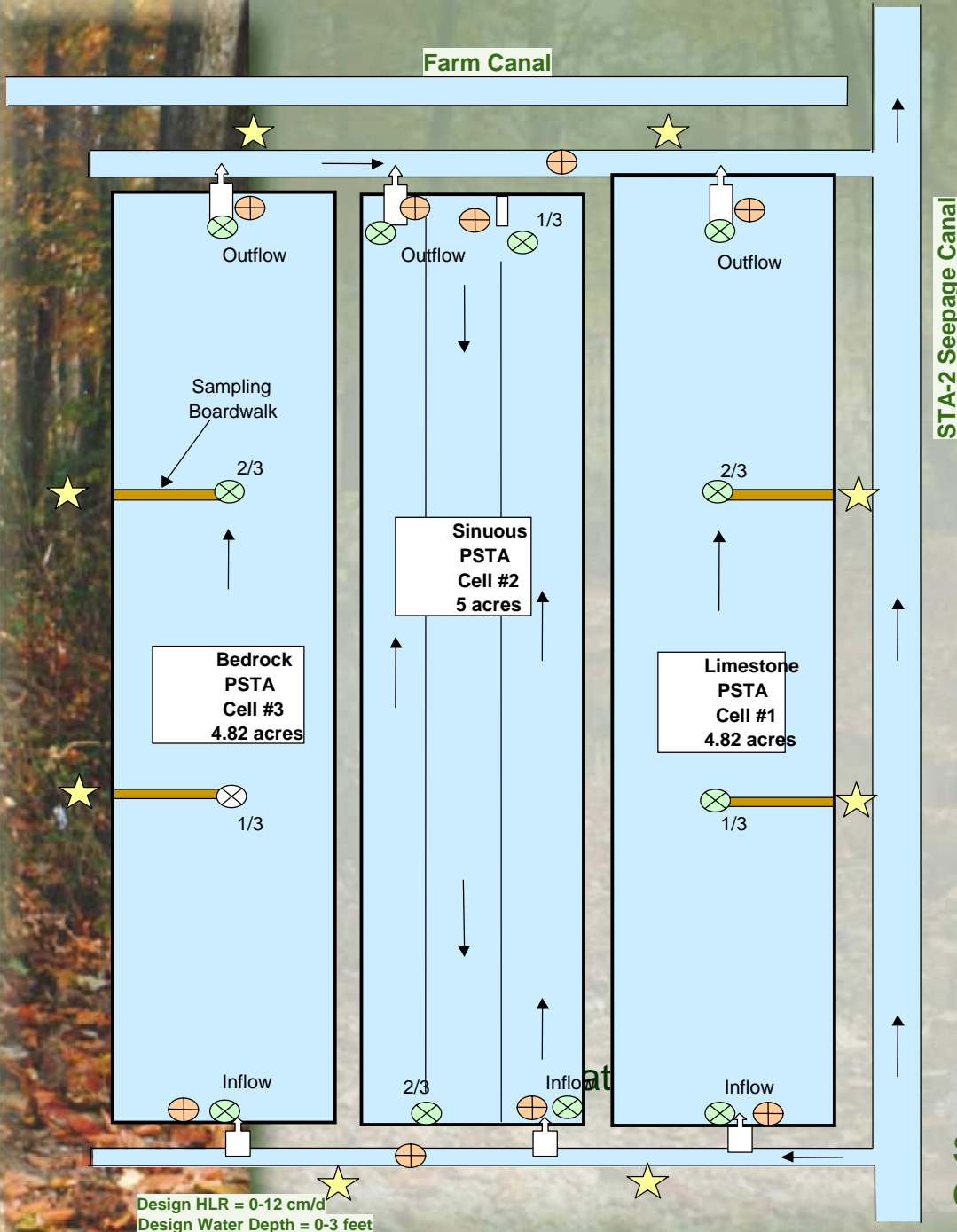
PSTA Test Cell Treatment 2 - Shellrock Substrate



PSTA Phase 1 Research- Test Cells




Field-Scale PSTA - Approximate Site Plan and Monitoring Stations





The Leading U.S. Phytoremediation Firm

- Rhizosphere bioremediation – diesel-contaminated soil and herbaceous plants (1989) (Port Angeles, WA)
- Tropical ecosystems - field and greenhouse research and demonstration (Hickam AFB, Hawaii)
- Hybrid poplar systems - landfill caps, wastewater treatment, landfill leachate, plume interception (many locations)
- Phytostabilization - 35 square miles (Owens Dry Lake, CA)



Laramie, WY Former Superfund Site

- Residual wood preservatives following water flood oil recovery operations
- Major river relocation and restoration (2000 ft)
- Long term (20 yr.) evaluation of phytoremediation
- Integration with greenbelt/bikepath development
- Community involvement (EPA training video)

Key Remedy Components:

Waterflood Oil Recovery



Integrated Phytoremediation/Greenbelt Project



Key Remedy Components:

Integrated Phytoremediation /Greenbelt Project





Bunker Hill Superfund Site


- Phytostabilization of 1050 acre lead smelter site
- Extreme erosion, acidic soils, droughty, elevated Pb, Zn, Cd
- Vegetative cover and innovative engineering erosion control
- “Partnering” multiple agencies and stakeholders

Before Restoration



After Restoration





Guidance for Successful Phytoremediation *(CWRT/AIChE), 1999)*

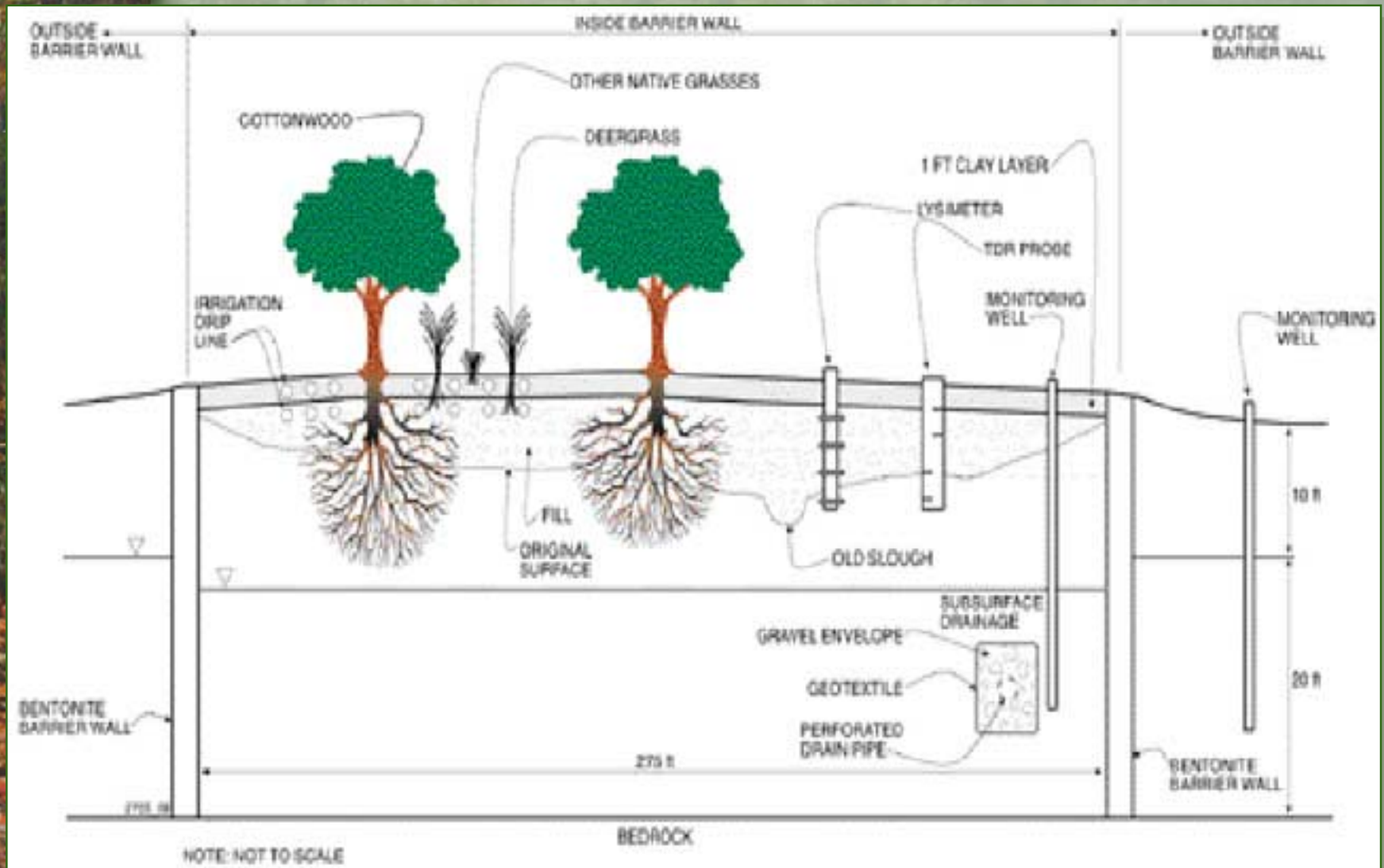
- Decision process
- Economic analysis
- Modeling phytoremediation systems
- Potential failure modes
- Operations, maintenance, sampling
- Literature reviews by contaminant group (Metals, PAHs, PHC, explosives, pesticides, nutrients)



Phytoremediation - Beale

- Containment system with barrier wall
- Hydraulic management provided by trees with backup groundwater treatment system
- Native cottonwood, live oak, deergrass, and shrubs
- Subsurface irrigation, drainage with recycling capabilities

Phytoremediation - Beale



Phytoremediation - Beale



Phytoremediation - Beale

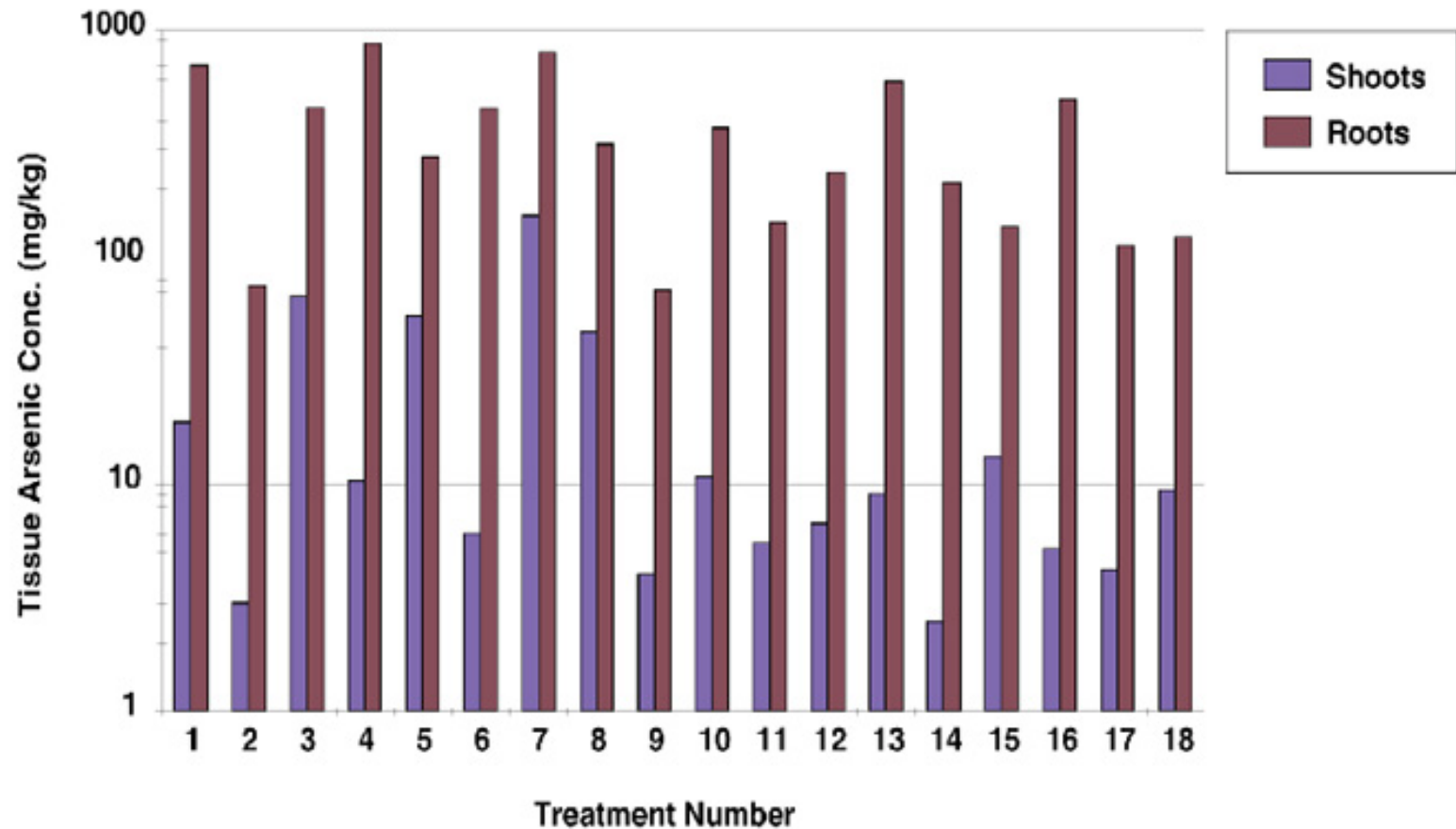




Phytoremediation - Palo Alto

- Former pesticide manufacturing facility
- Arsenic, VOCs and other metals in soil groundwater
- Groundwater 5 to 8 ft below ground surface
- Hydraulic control with Eucalyptus/Tamarisk to replace barrier wall
- Tamarisk to remove metals - primarily arsenic
- 330 trees planted in 1997/98

Phytoremediation - Palo Alto





Phytoremediation - Others

- 1) Oil Co. Landfarm - Mercury, lead, vanadium, cadmium, hydrocarbons, PCBs and PAHs in soil
 - Planted in 1997 with mixed legume (alfalfa) and prairie grasses
- 2) Agnico-Eagle Mines - silver, chromium, arsenic, cobalt in mine tailings
 - Evaluated plant extraction (ryegrass and alfalfa) with significant uptake in ryegrass



Summary & Conclusions



CH2M HILL has Demonstrated Our:

- Understanding of scope and issues related to Peconic River Restoration
- Experience in stream and wetland restoration
- Experience with use of Natural Treatment Systems for sediment and water remediation
- Design/build experience
- Experience with consensus building with multiple stakeholders
- Desire to make Peconic River Restoration a benchmark project